

SPECIFICATION

Semiconductor Device Manufacturing Method and Acceleration sensor
This application is a 371 of PCT/JP03/100859 01/29/2003

5 TECHNICAL FIELD

The present invention relates to photolithography techniques and can be applied to acceleration sensor having beam-structured movable portions, for example.

BACKGROUND ART

10 Patent Document 1 discloses an acceleration sensor having a beam-structured movable portion. The sensor element portion of the acceleration sensor has a movable electrode as part of the beam structure, first and second fixed electrodes, and a fixed electrode for canceling electrostatic force. The sensor element portion is covered and protected by a recessed portion of a cap substrate, with electrode extraction portions 15 connected to the four electrodes through interconnections and not covered by the recess of the cap substrate.

The beam structure of an acceleration sensor is formed by previously forming a sacrificial layer for supporting it, forming and patterning a conductive layer (e.g. doped polysilicon) on it, and then removing the sacrificial layer. Therefore, when an opening 20 for making contact with the silicon substrate on which the beam structure resides is formed after the formation of the conductive layer by applying photolithography from the same side as the beam structure, it is necessary that the photoresist satisfactorily cover a step height approximately equal to the sum of the thickness of the conductive layer and the thickness of the sacrificial layer. Now, the conductive layer itself has a thickness of 25 about 3.5 to 4.0 μ m and the sacrificial layer has a thickness of about 2.0 to 2.5 μ m, and

These and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention and the accompanying drawings.

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view showing part of the structure of an acceleration sensor to which the manufacturing method of a first preferred embodiment of the invention can be applied.

10 Figs. 2 (a) and (b) are cross-sectional views respectively taken along line A-A and line B-B in Fig. 1.

Figs. 3 to 11 are cross-sectional views showing a sequence of process steps for manufacturing the acceleration sensor of the first preferred embodiment.

15 Fig. 12 is a cross-sectional view used to describe an advantage of the first preferred embodiment of the invention.

Fig. 13 is a plan view showing part of the structure of an acceleration sensor to which the manufacturing method of a second preferred embodiment of the invention can be applied.

20 Figs. 14 (a) and (b) are cross-sectional views respectively taken along line E-E and line F-F in Fig. 13.

Figs. 15 to 23 are cross-sectional views showing a sequence of process steps for manufacturing the acceleration sensor of the second preferred embodiment.

25 Fig. 24 is a cross-sectional view showing part of the structure of an acceleration sensor to which the manufacturing method of a third preferred embodiment of the invention can be applied.